

US power grid costs rise, but service slips

March 5 2013, by Jonathan Fahey

America's power grid is like an old car. It gets the job done, even if its performance is slipping. But the repair bills go up every year and experts say only a major overhaul will reverse its decline.

An Associated Press analysis of utility spending and reliability nationwide found that electric customers are spending 43 percent more than they did in 2002 to build and maintain local electric infrastructure. Since then, [power outages](#) have remained infrequent; but when the lights do go out, it now takes longer to get them back on.

Neither the spending nor the reliability trends are dramatic on their own. But experts say the combination is revealing: it suggests that the extra money from electric customers isn't being spent wisely—or that utilities aren't investing nearly enough to upgrade fragile equipment that is increasingly threatened by major storms.

"The electric system is the critical [linchpin](#) of our society, and we are operating the overall system closer to the edge," said Massoud Amin, a grid [security expert](#) and professor of electrical and [computer engineering](#) at the University of Minnesota.

The diminishing returns on investment reflect several trends: The grid is getting old, making it more expensive to maintain service at current levels of reliability; day-to-day weather and major storms have become more extreme, meaning wires, poles and transformers have to be replaced more frequently; and when utilities replace aging or broken equipment, they are not always upgrading to modern technologies

common in other industrialized nations.

When utilities spend on equipment, regulators allow the companies to pass those expenses on to customers. In recent years, this portion of customer bills—the cost of delivering power—has been rising and pushing bills higher even though the cost of the power itself has fallen dramatically.

With the help of Ventyx, a software and data services firm that works with [electric utilities](#), and the utility consulting firm PA Consulting Group, the AP compared reliability statistics with the spending of 210 utilities across 24 categories of local distribution equipment.

In 2011, the most recent year for which annual data is available, the average U.S. electric customer was without power for 112 minutes, according to PA Consulting. That's a 15 percent increase since 2002 and the highest level in 10 years. The number of outages decreased slightly, from an average of 1.2 per year to an average of 1.1, but that statistic has shown no improvement since 2004.

Over that same period, annual spending per customer on local distribution equipment and maintenance rose about twice as fast as the rate of inflation, from \$163 to \$232, according to Ventyx. That does not include spending on power plants or major transmission lines.

The number of outages and longer amount of time needed to restore power doesn't take into account major blackouts such as last month's Northeast blizzard or last year's Superstorm Sandy. Those types of outages aren't included in reliability statistics because they are so dramatic and irregular that they would make it impossible to draw a clear picture of the grid's performance from year to year. But outages caused by extreme weather are occurring with greater frequency—a rising threat that cannot be ignored, experts say.

The grid—an interconnected web of power plants, substations, transformers and wires spanning the continent—is often described as the world's biggest machine. Within it, there are three major regional grids—Eastern, Western, and Texas. And within those are thousands of local grids controlled by hundreds of different companies.

Because of this, and because U.S. geography is so diverse, reliability varies wildly.

In parts of the West, where vegetation is sparse and thunderstorms are rare, outages can be extremely rare, too. In dense urban environments, where power lines are underground, customers can go years without losing power. In much of the Northeast and Southeast, where storms are common and vegetation is dense, customers often must survive without power for a few days every year.

Overall, the nation's reliability improved steadily from the 1950s through the middle of the 1990s as utilities installed automatic switches that prevented small failures from affecting large numbers of customers, according to Mark McGranaghan, vice president of power delivery at the Electric Power Research Institute.

Then reliability leveled off. Utilities and regulators, having reached a relatively high level of service, turned their attention away from the grid. From 1994 through 1998, spending on local grid equipment shrank. It then started to rise slowly.

Despite the higher levels of spending over the past decade, service is getting no better, and evidence is mounting that it may be getting worse. Experts say this is a sign that the grid is less stable and in need of significantly more—and smarter—investment.

A series of recent outages caused by massive storms and equipment

problems have raised the awareness—and ire—of electric customers:

— Sandy knocked out power to 8.5 million customers in October in 21 states, the largest storm-related outage in U.S. history. A week later, 650,000 homes and businesses were still dark.

— In late June of last year, a set of storms called a "derecho" ripped through the middle of the U.S., killing power to an estimated 4 million homes and businesses along a path between Indiana and Virginia.

— In 2011, a technician made an error while replacing equipment on a line in Arizona, leading to the largest blackout in California history.

"Until people come face to face with it, they aren't outraged by it," said Joseph Eto, a scientist at Lawrence Berkeley National Laboratory who published a study last year that found reliability getting worse nationwide.

Every day, 500,000 Americans lose power for an hour or more, Amin said. Outages cost the economy \$80 billion to \$188 billion per year.

Some power failures are unavoidable. But others aren't, and experts say shockingly low-tech equipment is to blame. Across the country, some utilities don't know if a customer has lost power unless that person calls to complain. Many utilities still rely on paper maps of their systems that become outdated quickly.

In short, they struggle to find and repair problems, never mind preventing them.

It's "uncomfortably common" for utilities not to know exactly where their equipment is, or how it's laid out, said John Simmins, manager of EPRI projects that showcase a new generation of digital equipment

called the "smart grid," which is designed to better manage utility systems. Smart grids have sensors that can sniff out problems with equipment even before it fails, offering a chance to make repairs before an outage.

But the old analog equipment has worked well enough for decades, and utilities are often reluctant to try new things for fear they will be penalized by regulators if the improvements don't work as hoped.

"From the utility's perspective, the safest thing they can do to get their money is to do what they've always done," said Rich Sedano, a former Vermont regulator who now directs a nonprofit advisory group called the Regulatory Assistance Project.

But promoters of the smart devices say the new technology, if implemented, could lead to a wave of improvements the same way automatic switches strengthened reliability beginning in the 1950s.

The New Jersey utility PSE&G, one of the hardest hit by Sandy, filed a proposal with regulators last month to spend \$3.9 billion over the next ten years to install remote-monitoring equipment that would make its system better able to withstand storms.

"We live in a digital society," said Ralph Izzo, CEO of the utility's parent company PSEG. "This is about protecting our way of life."

There are other, simpler ways to harden the system, such as replacing traditional wooden poles with those made using stronger wood, concrete or fiberglass, and protecting substations in low-lying areas from floods.

Experts say average U.S. reliability will probably never be as good as it is in Japan or parts of Western Europe because the country is so big and its population so spread out. But experts say the frequency of outages

can still be cut, and there is ample room to reduce the amount of time customers are without power after outages.

"If we decide to make the investment to handle major storms better, we will improve our day-to-day reliability, too," McGranaghan said.

Not everyone thinks that's the best approach.

Jay Apt, a professor at Carnegie Mellon University and director of the school's Electricity Industry Center, said money could be better spent ensuring that communities can function better when the power goes out. That could mean installing backup power equipment in mass transit systems, police stations, gas stations, apartment buildings and grocery stores.

But whether it's better to protect the grid or help customers endure blackouts, it all still costs money that nobody wants to spend, even if it might reduce costs and frustration in the future.

"Every time you put a rate increase through," said Seth Hulkower, a former Long Island [Power](#) Authority executive, "customers go crazy."

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